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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
CALEY, MICHAEL H

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 12/19/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/808,666	SUTHERLAND ET AL.
	Examiner	Art Unit
	Michael H Caley	2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) *28 and 29* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25,27 and 28* is/are rejected.

7)☒ Claim(s) *26* is/are objected to.

8)☒ Claim(s) *29 and 30* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a)☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4)☐ Interview Summary (PTO-413) Paper No(s). _____
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other:

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-28, drawn to a conversion assembly apparatus, classified in class 385, subclass 24.

II. Claims 29 and 30, drawn to method of fabrication of a ceramic substrate, classified in class 438, subclass 106.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the disclosed methods of fabrication may be used for any type of ceramic substrate not necessarily mounted in conjunction with a flexible circuit or a conversion device. The flexible transmission line method may be used in manufacturing a transmission line for any number of applications such as in an exclusively [illegible]

During a telephone conversation with Bruce Johnsonbaugh a provisional election was made without traverse to prosecute the invention of a conversion assembly apparatus, claims 1-28. Affirmation of this election must be made by applicant in replying to this Office action. Claims 29 and 30 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 13, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Chun et al. (U.S. Patent No. 5,864,642).

Regarding claim 1, Chun discloses an optical to electrical conversion assembly comprising a substrate (Figure 1 element 22) having a surface onto which components of the conversion assembly (Figure 1 element 24) are attached. Chun also discloses a flexible circuit operatively and electrically attached to the surface (Column 1 lines 53-56).

Regarding claim 2, Chun discloses the conversion assembly as having both optical components and electrical components (Figure 1 element 24).

Regarding claim 20 -

(Column 1 lines 49-51).

Claims 1 and 13-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Clayton (U.S. Patent No. 5,708,297).

Regarding claim 1, Clayton discloses an optical to electrical conversion assembly comprising a substrate (Figure 1 element 46) having a surface onto which components of the conversion assembly (Figure 1 elements 54 and 56) are attached. Chun also discloses a flexible circuit operatively and electrically attached to the surface (Figure 1 element 50).

Regarding claim 13, at least one component is electrically attached to the flexible circuit by a low loss means.

Regarding claim 14, Clayton discloses the low loss transmission media as either microstrip or stripline (Column 10 lines 63-67).

Claims 1 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Galloway (U.S. Patent No. 5,539,848).

Regarding claim 1, Galloway discloses an optical to electrical conversion assembly comprising a substrate (Figure 5 element 51) having a surface onto which components of the conversion assembly (Figure 5 elements 111 and 112) are attached. Chun also discloses a flexible circuit operatively and electrically attached to the surface (Figure 5 element 51; Column 3 lines 23-33).

Regarding claim 13, at least one component is electrically attached to the flexible circuit by a low loss means (Figure 2 elements 61 and 76).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chun.

Regarding claim 3, Chun's first embodiment discloses all of the proposed limitations except for a type of conversion assembly. In an embodiment of the circuit board, however, Chun discloses the board as containing both an electrical to optical conversion assembly (Column 2 lines 43-45) and an optical to electrical conversion assembly (Column 2 lines 31-32).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included either an electrical to optical conversion assembly or an optical to electrical conversion assembly. Such a device would be capable of facilitating use of an optical link between components such as an optical network and electrical processing of data. Such an assembly including a flexible circuit would allow for use in physical environments unendurable for nonflexible cards.

Regarding claim 4, Chun's first embodiment discloses all of the proposed limitations except for an optical wavelength division multiplexer and demultiplexer. In a separate optical via to be part of a wavelength division multiplexed optical transmission line (Column 3 lines 54-57, Column 4 line 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included a wavelength division multiplexer in order to accommodate for optically multiplexed signals. Such an improvement would allow for an increase in the number of optical signals operably communicating with the device. Since the number of optical vias

could otherwise be very limiting for an application needing a large number of optical signals, it would have been advantageous to multiplex and demultiplex incoming and outgoing signals such that the vias would be operable to carry multiple channels.

Claims 5-8 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chun in view of Ueno et al. (U.S. Patent No. 5,184,399).

Regarding claims 5-8, Chun discloses all of the proposed limitations except for the surface as ceramic, having a low coefficient of thermal expansion, a conductivity rating of at least 25 W/m K, and as selected from the group consisting of BeO, AlN, or Al_2O_3. Ueno discloses a method of manufacturing a circuit board using an insulating substrate having a high thermal conductivity used for mounting semiconductor elements. Ueno teaches aluminum nitride as a desirable body for such an insulating substrate, which has a thermal conductivity of at least 170 W/m K (Column 4 lines 60-62). Such a substrate inherently has a low coefficient of thermal expansion.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a ceramic material such as AlN in an electro-optic device such as referenced in Figure 1 element 24 of Chun's electro-optic device board. It is old and well known in the art that optical components such as lasers are highly heat sensitive and that placement near electrical devices without proper thermal isolation could alter their behavior. Therefore, it would have been advantageous to use a substrate as disclosed by Ueno, which could work to dissipate heat generated in Chun's device effectively. Such an improvement would create better heat

dissipation within the semiconductor device, allowing for a more highly powered, faster device, or for the electrical and optical components to be placed within closer proximity of one another.

Regarding claim 12, Chun and Ueno fail to disclose electrical connections between conversion assembly components and the flexible circuit with solder. However, the Examiner takes official notice that such a means of creating electrical connections between optoelectronic components and a circuit.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have made the connections between the conversion assembly and the flexible circuit with solder. Chun describes the connecting means between an optoelectronic device and the flexible circuit as electrical pads or sockets (Column 1 lines 56-58). Changing these connections to solder connections would have been advantageous to create permanent connections between the device and board using a cheap, quick, and reliable manner.

Claims 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chun in view of Ueno and in further view of Turner (U.S. Patent No. 4,844,581).

Chun and Ueno disclose all of the proposed limitations except for the components as attached to the surface utilizing a thick film process for attachment of optical conversion circuits, routing of signals, and gold bond wire attachment. Turner, however, teaches using a thick film process to deposit gold on a ceramic substrate for connecting a laser chip onto the substrate via wire bonding (Column 2 lines 15-25, Column 3 lines 33-37).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used gold in a thick film process for attaching the optical conversion circuit,

routing signals and bond attachment of the device. The use of gold as a conductive element and as a bond wire is old and well known in the art as a superior means of connection with optical devices and is useful as a means to achieve optimal operation at high bit rates. The thick film circuit techniques provide a simple construction of a laser package and also provides for precise alignment between the laser and waveguide.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chun in view of Ueno and in further view of Perduijn et al. (U.S. Patent No. 6,392,778).

Chun and Ueno disclose all of the proposed limitations except for the substrate as undergoing an etch process and copper plated. Perduijn, however, teaches a circuit provided by a top layer of copper by means of an etch treatment (Column 3 lines 64-67, Column 4 lines 1-5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have etched and copper plated the substrate in order to achieve the desired electrical connections between components on the substrate. Such a method is old and well known in the art as a means of achieving reliable, low loss connections between elements. The method would have been advantageous in a device such as Chun's in order to dissipate heat from the electrical and optical elements due to the high coefficient of thermal conduction of copper.

Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clayton in view of Kronz et al. (U.S. Patent No.).

Clayton discloses all of the claimed limitations except for the frequency of the transmission media. Kronz, however, teaches a circuit board microwave waveguide with an operation frequency range above at least 5 GHz (Column 5 lines 34-38).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a transmission media with such a high speed frequency. Transmission frequencies within the gigahertz range are old and well known in the art of microwave technology and in operating frequencies of optoelectronic devices. Such a frequency would allow for high speed use and communication between components on the circuit card.

Claims 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clayton.

Clayton fails to disclose the means for achieving low loss transmission as described. The Examiner takes official notice, however, that such means as reducing reflections, lowering absorptive loss, preventing cross talk, reducing ringing and standing waves, eliminating imaginary impedance component, and matching source and load to transmission line are all methods for achieving desirable low loss transmission that are old and well known in the art.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have achieved low loss transmission by such various means. Achieving low loss transmission signals is advantageous to the reduce power necessary to drive the circuit and to help improve circuit timing characteristics. Realizing such low loss circuits is attainable through methods old and well known in the art such as matching networks, appropriate spacing between conductive elements, and adjustments of the dielectric.

Claims 21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chun in view of Lin et al. (U.S. Patent No. 6,225,568).

Regarding claims 21-23, Chun discloses all of the proposed limitations except for the crosshatched ground plane, solder mask, and layering. Lin, however, teaches a circuit board with ground plane (Figure 8 elements 120 and 140, Figure 9; Column 8 lines 50-53 and 60-61), solder mask (Figure 8), and flexible layer with attached conducting element (Figure 8).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have combined Chun's electro-optic device board with Lin's circuit board in order to create an efficient electro-optic device board with optimal transmission line characteristics as taught by Lin. Such a device would be advantageous to create optimal communication speeds between electronic chips on the electro-optic device board. The addition of the cross hatched ground plane would have been advantageous to improve the transmission characteristic of the conductive element. The addition of the solder mask would have been advantageous as a protective element for the conductive element.

Regarding claim 24, Chun discloses the flexible layer as polyimide.

Regarding claim 25, neither Chun or Lin disclose the thickness of the flexible layer. However, it is old and well known in the art that thin circuit boards [illegible] such as within notebook computers as well as other space-critical designs.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have made the flexible layer comprising polyimide about .0020 inches thick. Such a thickness level would constitute and negligible and therefore desirably thickness for the flexible element of the board. Additionally, the thickness of the flexible layer would be driven

primarily by the desired distance between the conductive element and the cross hatched ground plane. Such a distance would be determined by the properties of the conductive element and desired transmission characteristics. It would therefore have been an engineering expediency in order to create a polyimide layer .0020 inches thick in order to accommodate for the characteristics of the conductive element. Such an optimal thickness could be arrived at though experimentation by one of ordinary skill in the art.

Claims 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Galloway in view of Iguchi et al. (U.S. Patent Application Publication No. US2002/0181520).

Galloway discloses an operation circuit comprising a transmission line terminated with a VCSEL diode (Column 5 lines 42-55). Galloway, however, fails to disclose a series resistor creating a matching combined impedance between the VCSEL and resistor combination and the transmission line. Furthermore, Galloway fails to disclose the VCSEL as a current mode device powered by a 5V source wherein there is no additional power loss due to the resistor. Iguchi, however, teaches a driving circuit for a current mode VCSEL device (Figure 4 element 1) with laser driver circuitry (Figure 4) with a series resistor in which there is no additionally power loss due to the resistor (Page 3, 0046).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have driven a VCSEL device on a flexible circuit board as proposed. Impedance matching the circuit with a series resistor would reduce power necessary to drive the laser, as well as improve response time due to lack of reflection. Furthermore, the current mode VCSEL

and 5V source are well known and typical in the art and it would be advantageous to construct the device accordingly to reduce complexity.

Allowable Subject Matter

Claim 26 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael H Caley whose telephone number is (703) 305-7913. The examiner can normally be reached on M-F 8:30 a.m. - 5:00 a.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (703) 305-3492. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

mhc
December 13, 2002